



Project Schedule and Cost Baseline Procedure Guide *OETI-PMP-03*

Environmental Protection Agency
Office of Enterprise Technology and Innovation (OETI)

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Document Change History

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1. Introduction

This document defines the process by which staff within the Environmental Protection Agency (EPA)'s Office of Enterprise Technology and Innovation (OETI) performs project schedule and cost baseline activities.

1.1 Purpose

This document defines the methodology, process flow, and relevant standards by which OETI project staff performs project scheduling and cost baseline activities and identifies participants and their responsibilities.

1.2 Background

This procedure explains the steps necessary to develop schedule and cost baselines for OETI projects. If required, this procedure also addresses establishing performance metrics in an Earned Value Management System (EVMS).

Project schedules are developed and cost and schedule baselines established once the project has been planned and approved according to *PMP-02 Project Initiation and Planning Procedure*. For the purpose of this procedure, a project schedule is defined as “the planned dates for performing schedule activities and the planned dates for meeting schedule milestones.”¹ In effect, for a project schedule to be meaningful and useful, the activities and milestones must be logically tied providing a dynamic estimate of work that can be compared with the initial plan developed in *PMP-02 Project Initiation and Planning Procedure*. From the time-phased, resource-loaded schedule a cost baseline can be developed. Developing cost and schedule baselines allow project team members a point from which activities can be defined, resources assigned, and performance measures established. Baselines also provide the starting point for change control, allowing a Project Manager the ability to maintain an audit trail of changes to a project schedule or costs (referred to as re-planning) from project start through project completion.

To reinforce these practices, the Clinger-Cohen Act of 1996 and the Office of Management and Budget (OMB) June 2006 Circular A-11 directs that investment projects have performance measures and management processes that monitor and compare actual performance to planned results. Additionally, OMB issued Memorandum 05-23 requiring the use of an EVMS for major IT investments to enforce the improvement of agencies' IT investment planning and execution.

¹ Project Management Institute, The Project Management Body of Knowledge (*PMBOK®*), Third Edition. 2004 Glossary p 382.

2. Approach

This section explains the approach used to develop this project schedule and cost baseline procedure. It details the assumptions, the degree of scalability of the procedures, and the industry standards, best practices, and EPA current practices consulted in creating this procedure.

2.1 Assumptions

The project schedule and cost baseline procedure assumes the following:

- OETI may manage several projects of varying size and complexity.
- Projects may be dependent on an overall project plan or may be independent projects managed under a portfolio of projects.
- Performing this procedure requires that projects are authorized and funded in accordance with *PMP-02 Project Initiation and Planning Procedure*.
- This procedure is dependent on the use of an automated scheduling tool. It assumes that at a minimum, the Project Manager and Schedule/Earned Value (EV) Coordinator are effectively trained in the use of the tool and have ready access to the tool.
- For projects that require earned value management, this procedure is dependent on the use of an Earned Value Management tool. It assumes that at a minimum, the Schedule/EV Coordinator is effectively trained in the use of the tool.
- The project team responsible for analyzing scheduling and earned value metrics are effectively trained in project management and earned value management.
- At a minimum, projects of more than 30 calendar days in duration or valued at more than \$50,000 must be baselined and tracked.
- External requirements may dictate project direction and activities and may override the steps defined in this procedure. For example, EPA's Office of Environmental Information (OEI) is preparing and will issue an Earned Value Management Procedure to comply with the OMB directive to enforce the improvement of agencies' IT investment planning and execution. Where necessary to enhance project management and success of OETI system projects, OETI project management procedures add to the agency's minimum requirements articulated in OEI's EVM policy and procedures.

2.2 Scalability

As part of the project initiation and planning activities, the Project Manager uses certain criteria to determine to what extent the schedule and cost baseline procedure is applied to the project. Systems and large projects are generally more complex and require more regular and disciplined processes to effectively manage them. The extent of the procedure applied is also impacted by internal and external requirements. For example, OMB requires agencies to improve execution, performance and oversight of major information technology (IT) projects through an earned value management system compliant with the ANSI-748 standard.

However, the extent of the schedule and cost baseline procedure and the number of resources involved in the process can be adjusted based on unique project requirements, especially for small projects with few or no dependencies, a low level of risk, and a relatively short duration, as well as non-system projects.

Another consideration is if the project requires earned value management (EVM). The following criteria should be utilized to help guide those involved in the decision-making process:

- Will the Capital Planning and Investment Control (CPIC) process be a requirement?
- Is the project at least six months in duration and at least \$500K?
- Is the project high-risk, high-profile, or considered “complex”?
- Will the resources be dedicated to the project for at least three months?

An answer of “Yes” to one or more of these questions may indicate that EVM is needed for the project. The project team should evaluate these and other unique characteristics of the project during the planning process and determine how best to adjust the procedure to address specific project requirements. Table 2.1 below provides guidelines for applying this procedure.

Table 2-1. Project Schedule and Cost Baseline Procedure Scalability Guidelines

<input type="checkbox"/> Procedure	<input type="checkbox"/> Does the Procedure Apply?	<input type="checkbox"/> Determining Procedure Scalability
OETI-PMP-03 Project Schedule and Cost Baseline Procedure	Applies to all projects	<ul style="list-style-type: none"> ▪ All projects should document basic schedule and cost information ▪ The detail required in the cost and schedule baselines is based on project size, cost, resources/contractors involved, and project duration ▪ If CPIC or CPIC Lite is required, earned value management data is captured

2.3 Best Practices

The OETI vision includes the employment of best practices from both industry and the EPA. This procedure incorporates the following best practices and existing regulations and policies:

- **EPA regulations and standards**
 - EPA Directive 2100.5, System Life Cycle Management Policy. Available at <http://intranet.epa.gov/oei/imitpolicy/qic/ciopolicy/2100.5.pdf>
 - The EPA Interim Agency System Life Cycle Management Procedures. Available at: http://intranet.epa.gov/otop/policies/Extended_InterimProcedures.pdf
 - U.S. Environmental Protection Agency (EPA) Earned Value Management Procedures – Addendum to CPIC Procedures, December 18, 2004. Available: http://intranet.epa.gov/otop/policies/evm_procedures_dec18_2004_v4.pdf
- **Federal regulations, industry standards, and best practices**
 - American National Standards Institute/Electronic Industries Association Standard 748-A (ANSI/EIA-748A) A Standard for EVMS Intent Guide. Available at: http://www.ndia.org/Content/ContentGroups/Divisions1/Procurement/PDFs10/NDIA_PMS_C_EVMS_IntentGuide_Jan2005.pdf
 - Earned Value Glossary – Glossary of Earned Value Management Terms. Available: <http://www.acq.osd.mil/pm/faqs/glossary.htm>

- Project Management Institute *Project Management Body of Knowledge (PMBOK®) Guide*, Third Edition, 2004.
- Department of Defense Integrated Master Schedule Data Item Description, March 30, 2005. Available: <https://acc.dau.mil/CommunityBrowser.aspx?id=19545>
- Department of Defense Handbook, Work Breakdown Structure, May 27, 2004. Available: <https://acc.dau.mil/CommunityBrowser.aspx?id=56317>
- OMB Circular A-11 (Part 7, Planning, Budgeting, Acquisition & Management of Capital Asset), November 14, 2003. Available: <http://www.whitehouse.gov/OMB/circulars/a11/03toc.html>
- OMB Policy Letter M-05-23, “Improving Information Technology Planning and Execution,” dated August 4, 2005. Available: <http://www.whitehouse.gov/omb/memoranda/fy2005/m05-23.pdf>

3. Roles and Responsibilities

Table 3-1 presents the roles and responsibilities for OETI project staff involved in project scheduling and cost baseline activities. This table lists functions or tasks that each project role performs. While each role will be assigned to an individual staff member, an individual may perform multiple roles for a project.

Table 3-1. Project Scheduling and Cost Baseline Roles and Responsibilities

Role	Responsibilities
Project Manager	<ul style="list-style-type: none"> Reviews and approves WBS Reviews and approves cost and schedule baselines Ensures an Integrated Baseline Review (IBR) is performed (as applicable)
Project Team Lead	<ul style="list-style-type: none"> Reviews and approves (as applicable) the WBS and project schedule for a specified portion of the scope of work Reviews and approves (as applicable) cost and schedule baselines for a specified portion of the scope of work
Control Account Manager (CAM)	<ul style="list-style-type: none"> Refines the WBS to meet stated requirements and defines work packages and control accounts for a specified portion of the project Develops the schedule baseline, including activities and milestones, sequencing, estimating durations, determining critical path, and resource allocations (loading and leveling) Establishes status metrics as required Provides material and other direct costs for the project to assist with the development of the cost baseline Reviews the baseline cost estimate proposal to ensure that the setup allow sufficient collection of information to understand and manage performance Submits schedule and cost baseline approval package to Project Team Lead (if applicable) and Project Manager <p>Note: If this person is not the Contracting Officer's Representative (COR) he or she should consult with the COR to ensure understanding of the contractor's responsibilities and reporting requirements per the contract</p>
Schedule/EV Coordinator	<ul style="list-style-type: none"> Facilitates scheduling and cost baseline preparation Assists the CAM with the definition of the WBS, work packages, and control accounts for the project Compiles IMS in coordination with CAMs Provides schedule and baseline reports to CAMs and Project Manager for analysis and review

4. Procedure

This section presents the process flow for project schedule and cost baseline and describes each step of the process in detail.

4.1 Process Flow Diagram

Figure 4-1 illustrates the process for the project schedule and cost baseline procedure and the activities to be performed.

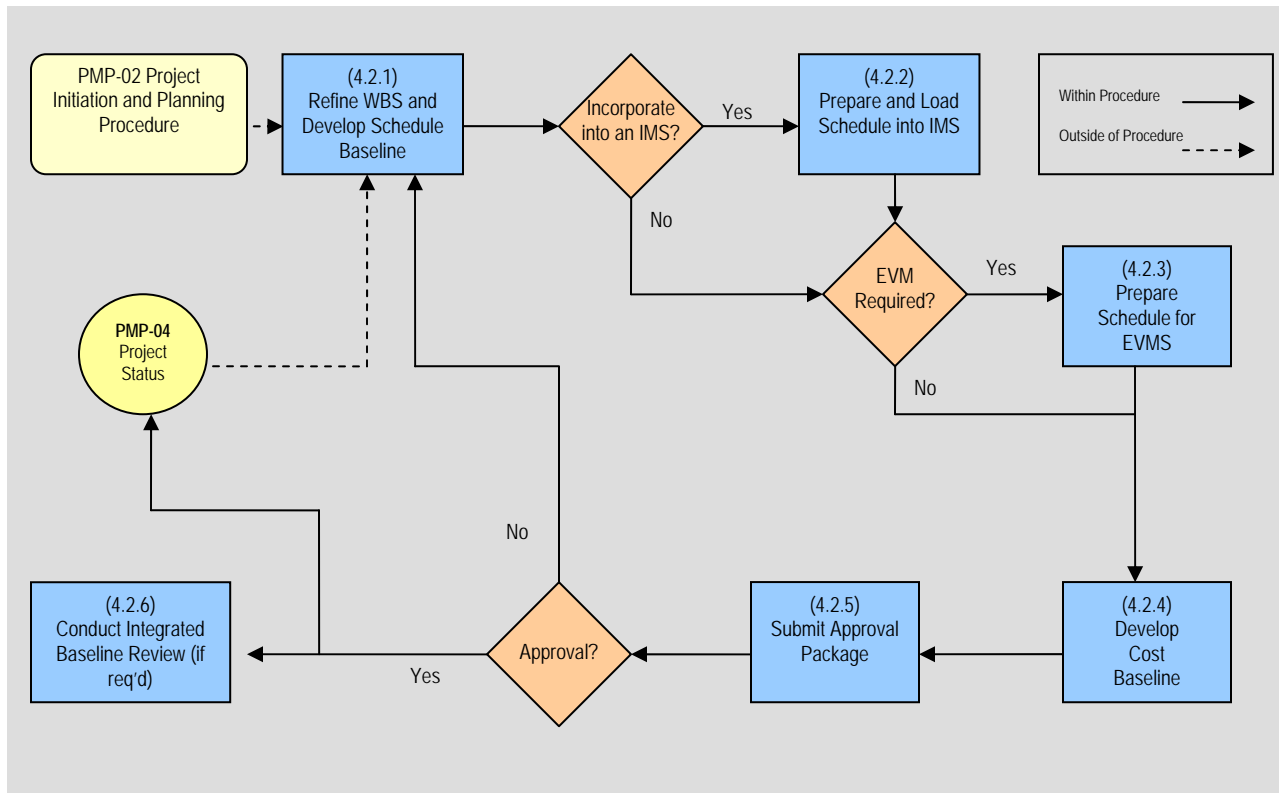


Figure 4-1. Project Schedule and Cost Baseline Process

4.2 Steps

The following sections describe the steps of the project schedule and cost baseline process shown in Figure 4-1.

The following figure illustrates the relationship of the components to develop a project schedule and cost baseline. The detail and descriptions of these components is provided in the following sections.

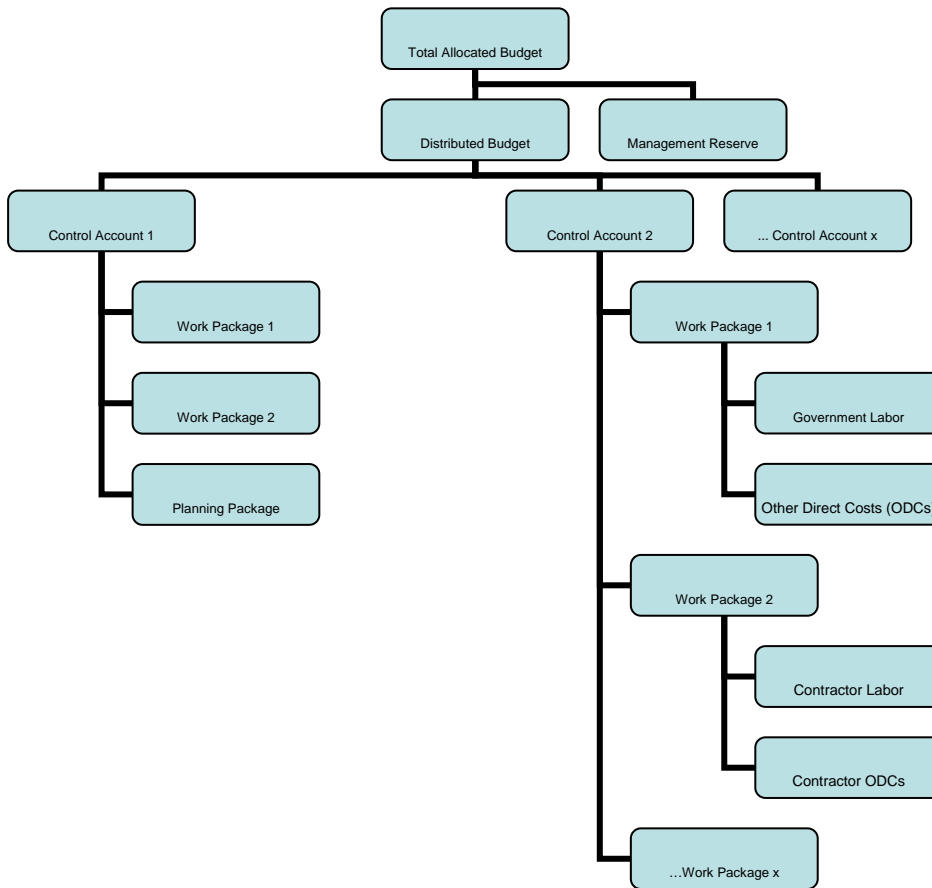


Figure 4-2. Component Relationship

4.2.1 Refine WBS and Develop Schedule Baseline

This procedure begins after project approval (or planning activities that result from approval to re-baseline an existing project) as determined through completion of *PMP-02 Project Initiation and Planning Procedure*. During the project planning phase, key roles for the project are defined and documented in the Project Management Plan (PMP), including the role of Schedule/EV Coordinator. The PMP should also include a high level description of schedule and baseline responsibilities. For purposes of this procedure, the description of activities in the various steps refers to a Control Account Manager, although for large projects there may be multiple CAMs. Likewise, for smaller projects, the Project Team Lead role and CAM role may be performed jointly. For larger projects, a Project Team Lead may have several CAMs managing aspects of the scope of work within their responsibility.

The initial high-level work breakdown structure (WBS) for the project is developed during project planning and is updated in this procedure to include smaller, more manageable pieces of work. The WBS is defined as a 'deliverable-oriented hierarchical decomposition of the work to be executed by

the project team². The lowest level of the WBS is represented by the work packages that are scheduled, cost estimated, monitored, and controlled.

The CAM refines the high-level WBS to meet the following minimum requirements:

- Prepared using PMI's *PMBOK®* as a framework
- Contains a WBS dictionary
- Is structured to contain all work elements (scope)
- Is structured to support cost estimation
- Is structured to levels that satisfy status reporting, including schedule, costs, resources, and performance, and if required, earned value metrics
- Is structured to levels that identify all work activity in the way that it is planned to be performed.

For an OETI IT project, the WBS could be defined as shown in Figure 4-2. An additional WBS example and resources helpful in developing a WBS are provided in Appendix G and C respectively.

Notional Work Breakdown Structure

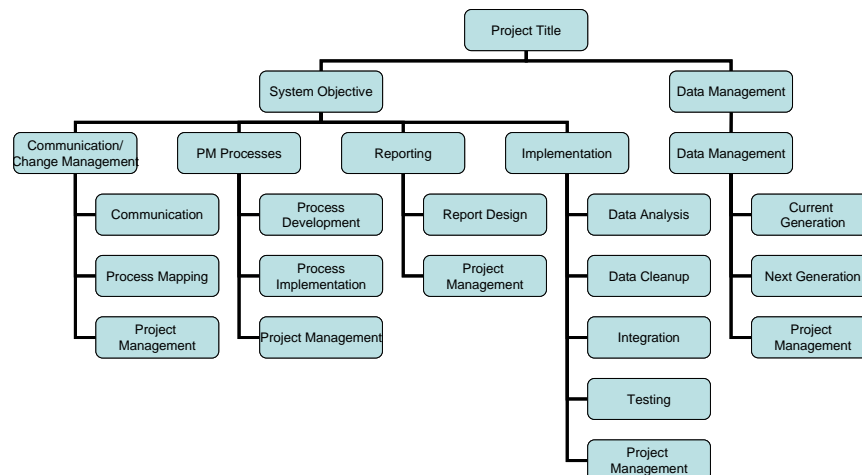


Figure 4-3. Notional WBS

The CAM submits the updated WBS to the Project Team Lead (if applicable) or the Project Manager for review and approval.

After approval of the WBS, the CAM, supported by the Schedule/EV Coordinator, develops a project schedule of activities that can be managed and monitored (see *PMP-04 Project Status, Reporting, and Forecasting* for details about monitoring activities). The following are the guidelines for developing a schedule:

- **Develop an activity list. An activity is a component of work performed during the**

² Project Management Institute, The Project Management Body of Knowledge (*PMBOK®*), Third Edition. 2004 Section 5.3 p 124.

course of a project. An activity list is a comprehensive list of all work or effort within the scope of the project. Sources of information for this list include the WBS, subject matter experts (SMEs), planning documents and the scope statement. An activity list is different from a WBS in that an activity list is activity-based whereas a WBS is deliverable-based. The activity list enumerates the actions that need to take place to achieve the objectives identified in the WBS. The activity list should include attributes of the activities, including who needs to perform them, constraints, assumptions, and imposed dates. All required EPA activities such as providing input, reviewing drafts, and participating in meetings or workshops should also be included.

- **Develop a milestone list.** A milestone list includes deliverables or other major milestones and should be designated as *mandatory* (with a Statement of Work [SOW], system life cycle [SLC], or other reference) or *discretionary* (no such reference). Contractor deliverables are mandatory and specified in the contract. Additional information regarding contract terms and contractor performance requirements can be found in *PMP-10 Procurement Management Procedure*. Milestones are zero-duration activities.
- **Sequence activities by identifying dependencies (internal and external).** The majority of activities should have dependencies (predecessors and successors). A dependency is a relationship between two activities, in which one activity depends on the start or finish of another activity for it to start or finish. The typical relationship types are finish-to-start, start-to-start and finish-to-finish.
- **Minimize the use of lag time.** Lag is the interval of time that occurs between a predecessor and successor activity or milestone. It is the amount of time typically associated with no effort between activities. For example, from the point of view of the trainer, there is lag between developing training materials and conducting training. From the point of view of the manager, there are activities such as approving training materials, finalizing software configuration, and obtaining user acceptance testing results that must happen between finishing the development of training materials and conducting the training. A robust schedule offers visibility into the activities taken together by ensuring these activities exist and are not represented as lags (even if they are external to the project). Lag times should be used only to represent a period of time that is outside the control of the project.
- **Estimate the duration of activities.** Use historical data such as past project schedules, lessons learned, known constraints, and expert judgment to estimate the duration of activities. To the extent possible, elicit input from the people performing the work to estimate the duration of activities. Ensure the calendar associated with the project schedule includes non-work days such as holidays and weekends to accurately reflect available work days for activities.
- **Determine the critical path.** Once all the dependencies have been identified, the critical path(s) can be determined. The critical path is typically the sequence of activities that determines the duration of the project. Generally, it is the longest path through the project.³
- **Assign resources to the activities.** Resources are named EPA staff or contractor resources. For activities six months⁴ or more in the future, the labor categories of required resources are acceptable if the name has not yet been identified. It is recommended that the

³ http://www.pmi.org/prod/groups/public/documents/info/pp_pmbokguidethirdexcerpts.pdf, p. 49

⁴ This time period is based on best practice but can be modified as determined by the Project Manager

labor category identify the expertise required. If a labor category is used rather than the name of an available staff member or contractor, a Project Team Lead initiates the process of obtaining the resource. Within six months of the activity start date, the labor categories should be replaced with named staff or contractor support.

- **Apply resource leveling.** This step is performed to ensure that schedule dates are realistic given the resources available. If a resource is over- or under-assigned based on workload (e.g. scheduled for 80 hours on a five day activity, or 200% allocated), manual or automated resource leveling will apply adjustments for a realistic view of the activities, resources, and duration of a project. Manual resource leveling can be an adjustment to staffing, activity duration, or activity sequencing; automated resource leveling can be done by a scheduling tool, to push out the duration of activities to accommodate resource constraints.

Completion of these steps produces a detailed project schedule. Once completed, the CAM reviews the project schedule to ensure that it reflects all applicable planning documents (e.g., Project Management Plan, SLCM documentation, contractor's proposal if a contractor is integral to the project activities, etc.) and to ensure that the proposed activities are reasonable for the time planned. The following questions should guide this review:

- Are all project deliverables (if applicable) represented in the schedule?
- Does the proposed timeline support dependent activities?
- Is the approach to the work, codified in the schedule, workable at EPA (i.e., is there sufficient time for building consensus, appropriate reviews, etc.)
- Are activities linked? If activities are based on date constraints rather than links, statusing the schedule will not provide useful results.
- Are resources appropriately allocated (i.e., not over or under utilized)?
- Are activities short enough in duration and/or milestones sufficiently close together that the status process will provide insight into project progress?
- Is the schedule formatted properly?

The Schedule/EV Coordinator makes any necessary adjustments to the schedule. The schedule is then reviewed and approved by the Project Team Lead (if applicable) and ultimately, the Project Manager.

If the project will not be tracked and monitored as part of a group of other projects (i.e., incorporated into an Integrated Master Schedule (IMS)) and has an earned value management requirement, the procedure continues with step 4.2.3. If the stand alone project does not have an earned value management requirement, the procedure continues with step 4.2.4.

4.2.2 Prepare and Load Schedule into IMS

The IMS contains one or more project schedules (as defined in *PMP-02 Project Initiation and Planning Procedure*) that are rolled up and linked where appropriate with cross-project dependencies for reporting and monitoring purposes. The IMS "is an integrated schedule containing the networked, detailed tasks necessary to ensure successful program execution"⁵. The Schedule/EV Coordinator prepares the project schedule for incorporation into the IMS, coordinating the summary tasks,

⁵ Department of Defense Integrated Master Schedule Data Item Description, page 1

milestones, and EPA activities with those that may already exist in the IMS.

After the Schedule/EV Coordinator incorporates the project schedule into the applicable IMS and establishes all links with cross-project dependencies, the updated IMS is distributed to all CAMs for their review. Each CAM reviews the updated IMS and works with the Schedule/EV Coordinator to ensure that the impact to their control account is accurately reflected, particularly the cross-project dependencies. The CAM's review should include whether a new activity with a dependency to an existing activity creates a conflict, date slip, or other risk to their control account. The Schedule/EV Coordinator works with the various CAMs to make any necessary adjustments to the IMS. The IMS is then reviewed and approved by the Project Manager.

If the impact to an existing, baselined project is such that the scope of the work changes, or the variance to the original plan is outside of established project thresholds, that project may require re-planning. The cost and schedule variance (and thus impact) is determined according to *PMP-04 Project Status, Reporting, and Forecasting Procedure*. PMP-04 also describes steps to identify the need to re-plan the project. If a re-plan is necessary, a change request is initiated according to the process established in *PMP-08 Change Control Procedure*.

If the project does not have an earned value management requirement, the procedure continues with step 4.2.4.

4.2.3 Prepare Schedule for EVMS

If the project is incorporated into an EVMS, there are certain fields in the schedule⁶ that need to be coded with specific information to properly track project performance and EV metrics. These fields designate the control accounts and work packages necessary to establish the cost and performance baselines. Appendix H provides the specific information needed to prepare the schedule for integration into the EV tool.

The Schedule/EV Coordinator works with the CAM to ensure the coded fields properly represent the work packages and control accounts necessary for project monitoring, that they follow EV standards and meet the requirements of the EV tool. The following sub-steps describe the establishment of the control accounts and work packages.

4.2.3.1 Establish Control Accounts

A control account is a management control point defined by the lowest level of the WBS. It is where work is planned, earned value is rolled up, and actuals are captured. Using the notional WBS shown in step 4.2.1 Figure 4-3, the control accounts are associated with the lowest level of the WBS, or in this case the fourth level. This level includes: Communication, Process Mapping, Process Development, Process Implementation, Report Design, Data Analysis, etc. as well as the Project Management for each component.

The Schedule/EV Coordinator works with the CAM to ensure the control accounts are established appropriately, as governed by the EV standards and requirements of the EV tool.

⁶ The term 'schedule' is used to refer to a stand-alone schedule, or to a part of an Integrated Master Schedule (IMS), whichever is appropriate for the size and complexity of the project being monitored, and as determined by the Project Manager.

4.2.3.2 Establish Work and Planning Packages

A work package is a “deliverable or project work component at the lowest level of each branch of the work breakdown structure.”⁷ The Schedule/EV Coordinator works with the CAM to decompose the control accounts defined in sub-step 4.2.3.1 into work packages. The work package is the level where work is planned and costs are developed.

The CAM assigns an earned value technique (EVT) to each work package. These techniques include 50/50, 0/100 (or another start/finish allocation approved by the Project Manager), Milestone, Percent Complete, Level of Effort (LOE), and Planning Package. Refer to Appendix F for definitions of these and other techniques. Cost baseline proposals should maximize use of objective EVTs such as 50/50, 0/100, and Milestone and minimize use of subjective techniques such as Percent Complete and LOE. Objective techniques take the guess work out of earning value for the performance of work.

A planning package is a “WBS component below the control account with known work content but without detailed schedule activities.”⁸ Planning packages are acceptable when approved by the Project Manager, and for projects that cannot be planned until certain information, like updated requirements, is available.

The Schedule/EV Coordinator works with the CAM to ensure the work packages are established appropriately, as governed by EV standards and requirements of the EV tool. The schedule is then reviewed and approved by the Project Team Lead (if applicable) and ultimately, the Project Manager.

The output of this step is a baselined schedule.

4.2.4 Develop Cost Baseline

The CAM began the process of developing a cost baseline through the development of the project schedule activities and durations and the assignment of resources in step 4.2.1. In addition to the EPA labor and contractor costs, any material and other direct costs (ODC) need to be added to the estimate. The CAM is responsible for providing these additional costs to the Schedule/EV Coordinator for the cost baseline development.

The cost estimate must be within the constraints of the distributed budget approved in the planning process. If the cost estimate exceeds the approved distributed budget, the CAM must modify the cost estimate by working through the procedure iteratively, or work with the Project Team Lead (if applicable) or Project Manager to take the appropriate action to revisit the budget in the planning process (see *PMP-02 Project Initiation and Planning Procedure*).

In addition to and separate from the distributed budget, a management reserve (MR) is typically identified. This MR is a provision in the plan to mitigate cost and schedule risk. The MR is an amount of the total allocated budget withheld for management control purposes rather than designated for the accomplishment of a specific task or set of tasks. The Project Manager establishes the MR amount. The Project Manager is responsible for providing the MR amount to the Schedule/EV Coordinator for the cost baseline development. The MR is not part of the performance measurement baseline.

Project with EV requirement: If the project requires EV management, the resource costs are

⁷ From the glossary of the Project Management Institute *Project Management Body of Knowledge* (PMBOK®), Third Edition, 2004.

⁸ *Ibid.*

calculated by entering the resource-loaded schedule into the EVMS; the additional material and ODCs are also loaded into the EV tool. An average labor rate for EPA staff and contractor staff can be used in the EV tool calculation, at the discretion of the Project Manager and as outlined in the PMP. The Schedule/EV Coordinator loads the schedule and additional costs into the EVMS.

The Schedule/EV Coordinator distributes the following items to the CAM to aid in their analysis of the cost baseline:

- Baseline Schedule – schedule developed in step 4.2.3
- Control Account Plan (CAP) Report – A report showing the time-phased budget for the project period of performance for each control account
- Additional EV Reports - Reports showing the earned value metrics for each control account and work package, including milestones associated with each work package.

The CAM reviews the cost baseline for the following related considerations:

- Does the Budgeted Cost of Work Scheduled (BCWS or PV) by month seem reasonable?
- Is the baseline overly front- or back-loaded?
- Are there peaks and valleys where expected?
- Are all authorized funds included in the baseline?
- Is the resource loading methodology reasonable?
- Is there reasonable use of EVTs?

The Schedule/EV Coordinator works with the CAM to ensure these correct baseline costs are captured in the EV tool.

Project without EV requirement: If the project does not require EV, the resource costs can be calculated in the project schedule by ensuring the labor rate for each resource is entered into the schedule. An average labor rate for EPA staff and contractor staff can be used, at the discretion of the Project Manager and as outlined in the PMP. This labor cost calculation is then added to the material and ODC costs budgeted for the project to capture the project cost baseline. The Schedule/EV Coordinator uses this information to populate and maintain the cost baseline in a spreadsheet for project status reporting.

The Schedule/EV Coordinator distributes the following items to the CAM to aid in their analysis of the cost baseline:

- Baseline Schedule – schedule developed in step 4.2.2
- Cost Plan Report – A report showing the time-phased budget for the project period of performance

The CAM reviews the cost baseline for the following related considerations:

- Does the Budgeted Cost by month seem reasonable?
- Is the baseline overly front- or back-loaded?
- Are there peaks and valleys where expected?
- Are all authorized funds included in the baseline?
- Is the resource loading methodology reasonable?

The Schedule/EV Coordinator works with the CAM to ensure these correct baseline costs are

captured in the EV tool.

4.2.5 Submit Approval Package

The CAM compiles the approval package, comprised of the project schedule and cost baselines, and submits it to the Project Team Lead (if applicable) and ultimately, the Project Manager. The Project Manager reviews the baselines and compares them with the initial schedule and authorized resources developed in the planning process. If revisions are required, the Project Manager provides feedback to the Project Team Lead (if applicable) or the CAM with specific recommendations for changes, and the requisite updates are made by the Schedule/EV Coordinator and resubmitted for approval.

If the Project Manager approves the submitted schedule and cost baselines, the CAM and Schedule/EV Coordinator are notified and formally set the baselines and the project is monitored using the *PMP-04 Project Status, Reporting, and Forecast Procedure*.

Once the baselines are approved, any changes are initiated through the project's change control procedure (see *PMP-08 Change Control Procedure*).

4.2.6 Conduct Integrated Baseline Review (if Required)

If the project involves IT development activities with an EVMS requirement, an Integrated Baseline Review (IBR) is required (see August 4, 2005 memo OMB M-05-23 *Improving Information Technology Planning and Execution* in Appendix E). An IBR is a collaborative process by which the government validates that a contractor's proposed schedule and cost information is valid, reasonable, and compliant with the contract. IBRs are intended to provide a mutual understanding of the risks inherent in the contractor's performance plan and management control system.

The Performance Measurement Baseline (PMB) is the basis for review during the IBR process. The PMB is a time-phased budget plan with performance metrics against which contractor performance is measured, thus the contractor's project schedule and cost baseline are representative of this performance baseline. An IBR is typically performed before the contractor's cost and schedule baseline are integrated with other components of the project plan. It differs from the IMS in that it only addresses that work for which the contractor is solely responsible for delivering. In addition, the level of detail is typically greater than that found in the IMS. Once accepted, the PMB is represented in the IMS at a higher level and according to the IMS' work package structure.

The Project Manager is responsible for conducting the IBR in a timely and successful manner. The initial IBR is typically conducted within 45 days to six months of the award of a new contract. Subsequent IBRs should be conducted in between major phases of the project; as required due to a major change to an existing contract; or if there is a major change to the project scope or underlying assumptions that would trigger a re-baseline. IBRs may also be conducted on an ad hoc basis (with reasonable notice) should problems become apparent through the regular status review process.

The documents used to conduct an IBR include:

- WBS
- WBS Dictionary
- CAP
- IMS
- Earned Value Methods

- Earned Value Measurement Criteria

Other documentation that is used for reference during an IBR include: Request for Proposal, contractor's Technical/Management/Cost Proposal, Staffing Plan, Organizational Chart, Acceptance Criteria for Deliverables or Work Products, Risk Management Plan, Communications Management Plan, Subcontract Management Plan, and the project Concept of Operations.

The Project Team Lead(s) assesses the PMB and identifies risk areas by confirming compliance with the following:

- The technical scope of work is fully included and consistent with authorizing documents
- Key schedule milestones are identified
- Supporting schedules reflect a logical flow to accomplish the technical work scope
- Resources (budgets, facilities, personnel, skills, etc.) are adequate and available for the assigned tasks
- Tasks are planned and can be measured objectively, relative to technical progress
- Underlying PMB rationales are reasonable
- Managers have appropriately implemented required management processes.⁹

Potential risks are identified and documented as a result of the review process and captured, assessed and monitored according to *PMP-05 Risk Management Procedure*.

After completing the IBR, the Project Manager should assess whether they have achieved the purpose of the IBR:

- Have they gained a mutual understanding of the project PMB?
- Have they attained agreement on a plan of action to handle the identified risks?¹⁰

The Project Manager ensures that all identified risks are captured and tracked according to *PMP-05 Risk Management Procedure*. Likewise, issues that are identified during the IBR should follow the *PMP-06 Issue Management Procedure*.

⁹ NDIA, *Defense Program Manager's Guide to the IBR Process*, April 2003, page 17.

¹⁰ Ibid.

5. Considerations

The following provides a list of general best practices that should be considered when performing project schedule and cost baseline activities:

- Before the baselines are developed, be sure the project scope is clearly defined and communicated to, and understood by, the project team members that participate in the schedule and cost baseline process.
- Activities or deliverables should span durations of no more than two weeks. If the nature of an effort does not have activities of less than two weeks duration for any reporting period, the CAM should establish status metrics (i.e., units completed, percent complete, etc.) to demonstrate progress on longer duration activities.
- Use milestones to identify significant project events and to gauge if the project is on schedule.
- Incorporate contingency into schedule estimates.
- Do not create tasks with durations greater than two reporting periods long.
- Recognize that dedicated project staffing represents reduced risk for the project and that part time staff may not consider the project their top priority.
- Keep the staff tracking controls simple and at a high level. Avoid excessive detail.
- Preparation for the IBR should begin as soon as practical.
- Before executing the IBR, ensure the PMB reflects the entire scope of work, documented at the appropriate level of detail.
- Technical, Schedule, Cost, Resource, and Management Process risks identified during the IBR should be reviewed and incorporated into the project risk management planning.

Appendix A Acronyms

The following acronyms shown below are referenced in this document.

Abbreviation	Description
ANSI	American National Standards Institute
BCWP	Budgeted Cost of Work Performed (Same as Earned Value or EV)
BCWS	Budgeted Cost of Work Scheduled (same as Planned Value or PV)
CAP	Control Account Plan
CPIC	Capital Planning and Investment Control
COR	Contracting Officer's Representative
DO	Delivery Order
CR	Change Request
EIA	Electronics Industries Association
EPA	Environmental Protection Agency
EV	Earned Value
EVM	Earned Value Management
EVMS	Earned Value Management System
EVT	Earned Value Technique
IBR	Integrated Baseline Review
IMS	Integrated Master Schedule
IT	Information Technology
LOE	Level of Effort
MR	Management Reserve
NDIA	National Defense Industrial Association
ODC	Other Direct Cost
OEI	Office of Environmental Information
OETI	Office of Enterprise Technology and Innovation
OMB	Office of Management and Budget
PMBOK	Project Management Body of Knowledge
PMB	Performance Measurement Baseline
PMI	Project Management Institute
PMT	Performance Measurement Technique
PV	Planned Value
SLC	System Life Cycle
SME	Subject Matter Expert
SOW	Statement of Work
TO	Task Order
WA	Work Assignment
WAD	Work Assignment Document
WBS	Work Breakdown Structure

Appendix B Checklist for Preparing a Project Schedule and Cost Baseline

The following provides a checklist for the key activities associated with each step of this project schedule and cost baseline procedure.

Activities	Responsible Parties
4.2.1 Refine WBS and Develop Schedule Baseline	
<input type="checkbox"/> WBS is refined to meet the following requirements: <ul style="list-style-type: none"> <input type="checkbox"/> Prepared using PMI's PMBOK Guide as a framework <input type="checkbox"/> Contains a WBS dictionary <input type="checkbox"/> Structured to contain all work elements (scope) <input type="checkbox"/> Structured to support cost estimation <input type="checkbox"/> Structured to levels that satisfy status reporting, including schedule, costs, resource, and performance, and if required, EV metrics <input type="checkbox"/> Structured to levels that identify all work activity in the way that it is planned to be performed <input type="checkbox"/> Integrated schedule is submitted	Project Team Lead
<input type="checkbox"/> Schedule of activities is developed <input type="checkbox"/> Milestone list is developed <input type="checkbox"/> Activities are sequenced by identifying dependencies (internal and external) <input type="checkbox"/> The durations of activities are estimated using historical data (e.g., past project schedules, lessons learned, known constraints), and expert judgment <input type="checkbox"/> The calendar with the appropriate holidays breaks is used appropriately for each activity <input type="checkbox"/> Critical path(s) is established <input type="checkbox"/> Resources are assigned to the activities <input type="checkbox"/> Resource leveling is applied	CAM, Schedule/EV Coordinator
<input type="checkbox"/> Project schedule is reviewed to ensure that it includes all applicable planning documents and includes: <ul style="list-style-type: none"> <input type="checkbox"/> All contract deliverables are in the schedule <input type="checkbox"/> A proposed timeline is supported by dependent activities <input type="checkbox"/> An approach to the work, codified in the schedule, is workable at EPA (i.e., is there sufficient time for building consensus, appropriate reviews, etc.) <input type="checkbox"/> Activities are linked <input type="checkbox"/> Schedule is properly formatted <input type="checkbox"/> Resources are not over booked or under booked <input type="checkbox"/> Activities are short enough in duration and/or milestones sufficiently close together that the status process will provide insight into project progress	CAM, Project Team Lead
<input type="checkbox"/> Project schedule reviewed and approved	Project Manager

Activities	Responsible Parties
4.2.2 Prepare and Load Schedule into IMS	
<input type="checkbox"/> New material in the IMS reviewed for dependencies with project's activities, necessary changes or additions made are communicated to the Schedule/EV Coordinator	CAM, Schedule/EV Coordinator
<input type="checkbox"/> Schedule is prepared for incorporation into the IMS, including summary tasks, milestones, and EPA activities <input type="checkbox"/> Schedule is loaded into IMS and all external dependencies established <input type="checkbox"/> All activities within a task or within the project are sequenced <input type="checkbox"/> The dependencies and relationships between each of the tasks and activities are defined <input type="checkbox"/> Message is sent to all Project Managers that the IMS has been updated <input type="checkbox"/> IMS updated based upon feedback and direction from CAM	Schedule/EV Coordinator
<input type="checkbox"/> Updated IMS reviewed and any changes provided to Schedule/EV Coordinator <input type="checkbox"/> Modifications as a result of external dependencies reviewed and accepted	Project Team Lead, CAM
4.2.3 Prepare Schedule for EVMS	
<input type="checkbox"/> Control accounts are established according to EV standards and within requirements of the EV tool <input type="checkbox"/> Control accounts are decomposed into work packages and EV techniques are assigned	CAM, Schedule/EV Coordinator
<input type="checkbox"/> The schedule reserved fields are populated as required <input type="checkbox"/> Schedule "properties", such as Status Date and Project Start Date, etc., are populated as required	Schedule/EV Coordinator
<input type="checkbox"/> Baselined schedule is reviewed and approved	Project Team Lead (if applicable) and Project Manager
4.2.4 Develop Cost Baseline	
<input type="checkbox"/> Cost estimate is developed including EPA costs and contractor costs (if applicable) <input type="checkbox"/> Costs are within the budget developed in the planning process <input type="checkbox"/> Labor and other direct costs (ODCs) are included in cost baseline <input type="checkbox"/> Cost baseline, including contractor activities, is reviewed: <ul style="list-style-type: none"> <input type="checkbox"/> Does the PV by month seem reasonable? <input type="checkbox"/> Is it overly front- or back-loaded? <input type="checkbox"/> Are there peaks and valleys where expected? <input type="checkbox"/> Are all authorized funds baselined? <input type="checkbox"/> Is the resource loading methodology reasonable? <input type="checkbox"/> Is there reasonable use of performance measures? 	CAM
<input type="checkbox"/> Correct baseline costs are captured in the EV tool	Schedule/EV Coordinator, CAM
4.2.5 Submit Approval Package	

Activities	Responsible Parties
<input type="checkbox"/> Schedule and cost baseline package is prepared and submitted for review	CAM
<input type="checkbox"/> Cost and schedule baselines are reviewed and approved or feedback provided	Project Team Lead (if applicable), Project Manager
<input type="checkbox"/> Necessary revisions to the baselines are made	CAM, Schedule/EV Coordinator
<input type="checkbox"/> Project schedule is baselined; new portion of the IMS is baselined	Schedule/EV Coordinator
4.2.6 Conduct Integrated Baseline Review (if Required)	
<input type="checkbox"/> Performance Measurement Baseline is established and other required documentation is submitted	Contractor
<input type="checkbox"/> Ensure IBR is conducted within 45 days to six months of contract award	Project Manager
<input type="checkbox"/> IBR preparation activities are performed <input type="checkbox"/> PMB is accessed <input type="checkbox"/> Results of the assessment are documented <input type="checkbox"/> IBR out brief is conducted	Project Manager, Project Team Lead, CAM
<input type="checkbox"/> All identified risks and issues are captured and communicated for tracking and monitoring purposes according to relevant procedures	Project Manager

Appendix C Additional Resources

The following provides a list of key resources and references associated with the project schedule and cost baseline procedure that can be used to obtain additional background information, describe concepts and methodologies and assist in completion of the activities. Sample templates and plans may not be directly applicable but can provide additional information on scaling project status reporting for smaller projects.

	Form/Guidance	Source	Web site
1	Basic Project Scheduling and project management background	Principal based Project Management website	http://www.hyperhot.com/pm_sked.htm
2	Project Scheduling definitions and related concepts	University of Washington website	http://www.washington.edu/computing/pm/plan/schedule.html
3	Project Management Framework	State of Washington website	http://isb.wa.gov/tools/pmframework/
4	Project Management Templates and information	State of Virginia website	http://www.vita.virginia.gov/projects/cpm/templates.cfm
5	Project Management Sample Plans and Templates	U.S. Department of Energy website	http://cio.energy.gov/it-project-management/510.htm
6	Project Planning Guidebook	State of New York website	http://www.oft.state.ny.us/pmmp/guidebook2/Planning.pdf
7	CMMI Guidelines	Carnegie Mellon Software Engineering Institute website	http://www.sei.cmu.edu/cmmi/adoption/pdf/byrnes.pdf
8	DoD EVM Guidance	EVM DoD Policy and Guidance	http://www.acq.osd.mil/pm/currentpolicy/currentpolicy.html
9	National Defense Industrial Association	Defense Program Manager's Guide to the IBR Process	http://www.ndia.org/Content/NavigationMenu/Advocacy/Resources/PDFs30/program_managers_guide.pdf

Appendix D Interface Requirements

The purpose of this appendix is to provide general guidelines for collecting the appropriate information from contractors to ensure seamless integration of project data and promote efficient monitoring of the overall project. Frequently, data is needed by support contractors to enable the Project Manager and/or Project Team Leads to accurately assess real-time status against overall performance, schedule and cost objectives. In addition, the interface points among the different parties, both government and contractor, need to be fully delineated to ensure that each party understands their specific role and responsibility in data management and reporting and that the information can be efficiently captured utilizing the project's established management processes and tools. As a result, the data, reporting, and interface requirements should be well defined early in the process to ensure that they are fully described in the awarded contract, Work Assignments (WAs), Delivery Orders (DOs), and/or Task Orders (TOs). In addition, the frequency, format and mode of submission for the different reporting requirements also need to be defined within the contract or WA, DO, or TO.

The following series of questions is provided to help determine the data, reporting and interface requirements that may be required for a specific project. Requirements may vary significantly depending on the scope, complexity, size, duration and of the project and type of contracts awarded. Overall the questions are designed to help refine what kind of information will be needed to ensure effective management of the project and the correlating responsibilities of the contractor.

- Will the contractor be required to provide regular schedule and cost status reports?
 - What level of detail is needed regarding technical, cost, and performance on the status reports?
 - How frequent should the reports and/or data be submitted?
 - Will the contractor be required to provide earned value management data?
 - What kind of format will the contractor need to provide status reports and/or data?
 - Will the contractor be required to feed reporting data into an automated process or tool?
 - If so, what tools (if any) will the contractor be required to interface with or provide data to support?
 - What are the acceptable data submission formats?
 - What data elements must be provided?
 - What is the frequency for submission?
 - Is real-time data required?
- Will the Contractor be required to participate in an initial and/or ongoing IBRs?
- What are the Contractor's responsibilities related to development and updating of the Master Schedule?
 - Will the Contractor be required to provide schedule information in a specific format, software?
 - Will the Contractor be required to follow a defined WBS?

Appendix E OMB Policy Letter

EXECUTIVE OFFICE OF THE PRESIDENT OFFICE OF MANAGEMENT AND BUDGET

WASHINGTON, D.C. 20503

M-05-23

August 4, 2005

MEMORANDUM FOR CHIEF INFORMATION OFFICERS

FROM: Karen S. Evans, Administrator
Office of E-Government and Information Technology
SUBJECT: Improving Information Technology (IT) Project Planning and Execution

As we continue to realize the value of good project management, room for improvement remains in the execution of our IT projects. With the right tools and qualifications, managers will be better equipped to make decisions and carry out their missions. Over the past several years, agencies have improved the quality of their IT project planning and justification. We would now like to continue this improvement during the execution phase of the IT project. Therefore, the following guidance is provided to assist you in monitoring and improving project planning and execution and fully implementing Earned Value Management Systems (EVMS) for IT projects.

You are already required in your annual budget justifications to plan, invest, and document only those projects effectively linked to agency strategic and annual performance plans and which demonstrate improvement in program performance. We now want you to take the actions detailed in attachments A and B to this memorandum.

Attachment A outlines steps agencies must take for all new major IT projects, ongoing major IT developmental projects, and high risk projects to better ensure improved execution and performance as well as promote more effective oversight. Specifically, the attachment describes procedures regarding the following principles:

- Establishing and validating performance measurement baselines with clear cost, schedule and performance goals;
- Managing and measuring projects to within ten percent of baseline goals through use of an EVMS compliant with the guidelines in ANSI/EIA STD -748 or, for steady-state projects, perform operational analyses;
- Assigning to each project a qualified project manager; and
- Avoiding duplication by leveraging inter-agency and government-wide investments to support common missions or other common requirements.

Attachment B describes how agencies move to full implementation of EVMS for IT projects through:

- Developing agency policies no later than December 31, 2005;

- Including EVMS in contracts;
- Performing reviews to ensure the EVMS meets established requirements; and
- Ensuring performance goals are appropriate.

Attachment C offers additional information on resources and training to assist in developing and implementing policies for EVMS.

The Chief Information Officers Council will begin necessary actions to assist all agencies in consistently meeting these requirements including developing by October 2005 a model agency EVMS policy for IT projects. If you have any questions regarding this memorandum, please contact Stacie Higgins, at 202-395-0346 or stacie_higgins@omb.eop.gov.

Appendix F Earned Value Technique (EVT) Definitions¹¹

The following definitions describe the methods used to measure performance at the work package or planning package level.

Apportioned – The work package budget is earned in direct proportion to the amount earned on another related work package.

Level of Effort (LOE) – Support-type activity (e.g., project management, etc.) that does not produce definitive end products. It is generally characterized by a uniform rate of work performance over a period of time determined by the activities supported. If the work package is started, it is assumed to progress (and thus earn value) according to the original budget without deviation. According to EV best practices, it is generally advisable only for a small number of work packages that by their nature cannot be measured. By definition, the value earned by an open work package using this performance measurement technique (PMT) is always equal to its budget (BCWP=BCWS).

For a level-of-effort work package to earn value, it must be opened. When a level-of-effort work package is closed, the entire budget is earned in that period. Therefore, level-of-effort activities should be opened on or before the date they were scheduled for and should not be closed until the scheduled finish date.

Milestone – This EV technique associates value to a significant point or event in the project. These significant points or events, or milestones, are defined, and relative weights are assigned among them. This method can be applied to any work package, and it is generally the preferred method for work packages that span more than two fiscal periods. At any point, the value earned is the work package budget multiplied by the combined weight of the completed milestones and divided by the total weight of all milestones.

Percent Complete – An estimate, expressed as a percent, of the amount of work that has been completed on an activity or a work breakdown schedule component. The control account manager determines the percent complete. Percent complete shifts the burden of objective performance measurement to the individual or system that provides the information. This method is appropriate where long duration work packages exist and interim milestones cannot be established.

Planning Package – A WBS component below the control account with known future work content but without detailed scheduled activities. The work package budget represents a logical aggregation of future work within the cost account, and provides a means to budget future work for a complete control account estimate of cost. Typically, this PMT is assigned when the cost account manager does not have enough information to plan the detail of the work package budget. A work package with this PMT does not earn value; however, it is important for the computation of BAC and EAC.

50-50 – Fifty percent of the value is earned as soon as the work package is started, and the rest is earned when it is completed. This PMT should be used only for work packages that span a maximum of two fiscal periods because value cannot be earned in any intervening periods. For example, if the 50-50 PMT is applied to a work package spanning four months, it will never be possible for the work package to earn any value during the second and third months (assuming it does not finish early).

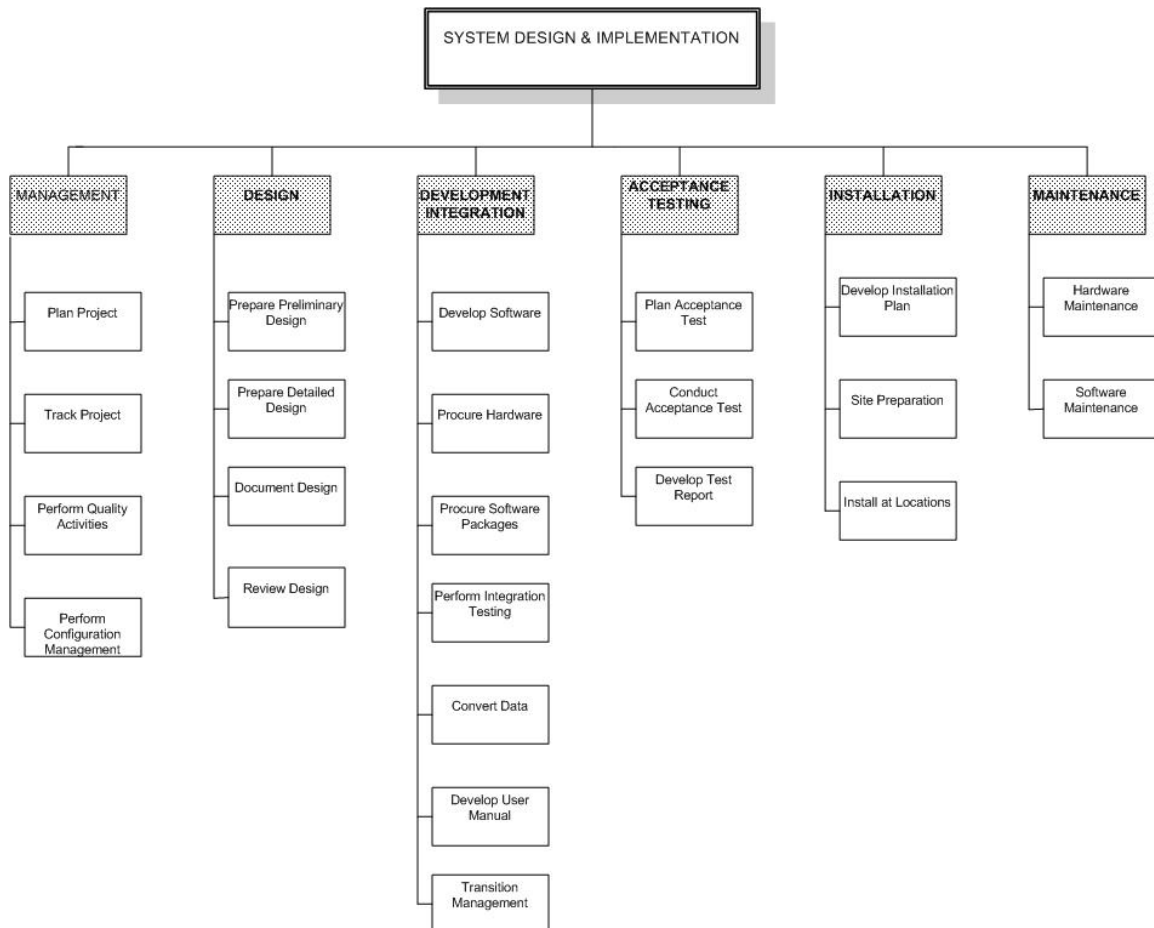
¹¹ PMT Definitions as defined by Project Management Institute *Project Management Body of Knowledge* (PMBOK®), Third Edition, 2004, NASA, and Deltek.

0-100 – No value is earned until the work package is completed, at which point the entire budget is earned. This method should be used only if the work package is scheduled to start and finish in the same fiscal period.

[user-defined allocation] – A user-defined start-finish allocation, such as 20-80 or 35-65, where a percent of the value is earned as soon as the work package is started, and the rest is earned when it is completed. This PMT should be used only for work packages that span a maximum of two fiscal periods because value cannot be earned in any intervening periods.

Appendix G Additional WBS Sample

Following is an additional example of a WBS structure for a standard System Design and Implementation effort.



Appendix H IMS Reserved Fields

This appendix provides specific information about Microsoft Project (MSP) fields that need to be populated to properly define the integration relationship between MSP and the EV tool. At a minimum, these reserved fields include:

(Note: *Italicized* text denotes the field name in the tool.)

- **Text21: *EV_WBS*** – This field corresponds with the control account ID. It represents the identifier that defines the control account associated with the WBS. Only those activities that are to be integrated into the EV tool will have this field populated.
- **Text22: *EV_WP*** – This field corresponds with the work package ID. It represents the identifier that defines the work package associated with the control account. Only those activities that are to be integrated into the EV tool will have this field populated.
- **Text23: *EV_MS*** – This field corresponds with the milestone ID. It represents the identifier that defines the milestone associated with the work package. Only those activities that are to be integrated into the EV tool will have this field populated.
- **Text24: *EV_EVT*** – This field corresponds with the earned value technique assigned to the work package. Only those activities that are to be integrated into the EV tool will have this field populated.
- **Text25: *EV_CAM*** – This field corresponds with the control account manager name and is associated at the control account level. Only those activities that are to be integrated into the EV tool will have this field populated.
- **Number11: *EV_MSWT*** – This field corresponds with the weight of the milestone. By default, this formula is based on the *Work* field divided by 60. The formula specifically reads [Work]/60. Only those activities that are to be integrated into the EV tool will have this field populated.
- **Date8: *TimeNow*** – This field describes the status date. As part of the statusing procedure, the status date is entered into the Time Now field. This field can be blank when a baseline schedule is submitted but will eventually be populated to help with the statusing procedure. Every activity in the IMS must be populated with the same status date.